

AUTOMOTIVE: ENGINE PERFORMANCE

COURSE DESCRIPTION

Automotive: Engine Performance is a course that prepares students for entry-level positions or advanced training in engine performance. The course covers electronic ignition and distributor ignition systems, fuel management, exhaust emission control, and computer input and output signals and will identify the different types of sensors used by automotive engine computers. Students will perform inspections, tests, and measurements for diagnosis and perform needed repairs. Education and experiences simulate automotive service industry operations through the use of training aids and modules and offer school-based learning opportunities.

Course content prepares students for the Automotive Service Excellence (ASE) Engine Performance test.

Recommended: Transportation Core

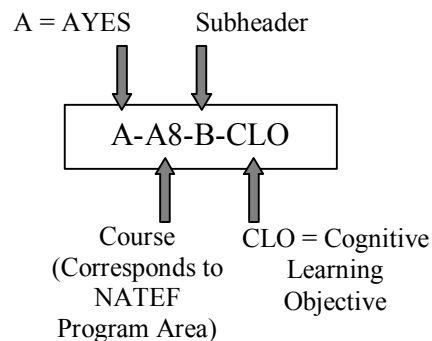
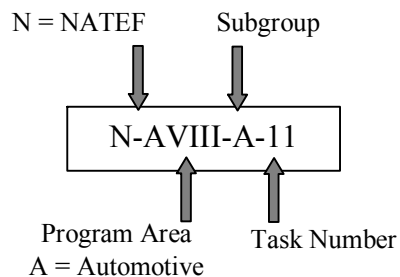
Requirement: A minimum of 250 hours must be dedicated to engine performance to meet minimum standards set by NATEF.

Recommended Credits: **2 or 3 (NATEF certified programs only)**

Recommended Grade Level(s): 11-12

Number of Competencies in Course: 60 / **87**

Note: Course is aligned with NATEF task list for Automotive: Engine Performance. Items have been organized based on requirements of Tennessee required course description format.



AUTOMOTIVE: ENGINE PERFORMANCE STANDARDS

- 1.0** Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.
- 2.0** Students will demonstrate automotive technology safety practices, including Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) requirements for an automotive repair facility.
- 3.0** Students will properly test, diagnose, and service General Engine.
- 4.0** Students will properly test, diagnose, and service Computerized Engine Controls.
- 5.0** Students will properly test, diagnose, and service Ignition System.
- 6.0** Students will properly test, diagnose, and service Fuel, Air Induction, and Exhaust Systems.
- 7.0** Students will properly test, diagnose, and service Emissions Control Systems Exhaust Gas Recirculation/ Exhaust Gas Treatment/ Evaporative Emissions Controls.
- 8.0** Students will properly test, diagnose, and service Engine Related.
- 9.0** Students will demonstrate communication skills required in the automotive service industry.
- 10.0** Students will demonstrate interpersonal and employability skills required in the automotive services industry.

AUTOMOTIVE: ENGINE PERFORMANCE

STANDARD 1.0

Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.

LEARNING EXPECTATIONS

The student will:

- 1.1** Demonstrate positive leadership skills in the classroom and community.
- 1.2** Participate in SkillsUSA as an integral part of classroom instruction.
- 1.3** Investigate how technology has made an impact on engine performance in the past 2 years.
- 1.4** Construct a job search network.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 1.1** Serves as a volunteer in the community.
- 1.2A** Applies the points of the creed to personal and professional situations.
- 1.2B** Assists with an officer campaign with Tennessee SkillsUSA.
- 1.3** Writes a technical report that shows technological advancements in engine performance.
- 1.4A** Refines employment portfolio.
- 1.4B** Completes a job search for employment opportunities.
- 1.4C** Researches job search opportunities through SkillsUSA.

SAMPLE PERFORMANCE TASKS

- Create a leadership inventory and use it to conduct a personal assessment.
- Participate in various SkillsUSA programs and/or competitive events.
- Analyze entry-level job skills and demonstrate proficiency in each skill.
- Implement an annual program of work.
- Attend a professional organization meeting.
- Participate in the Community Service competition with SkillsUSA.
- Places resume on national job search website with SkillsUSA at www.skillsusa.org.

INTEGRATION LINKAGES

SkillsUSA, *Professional Development Program*, Communications and Writing Skills, Teambuilding Skills, Research, Language Arts, Sociology, Psychology, Math, Math for Technology, Applied Communications, Social Studies, Problem Solving, Interpersonal Skills, Employability Skills, Critical-Thinking Skills, SCANS (Secretary's Commission on Achieving Necessary Skills), Chamber of Commerce, Colleges, Universities, Technology Centers, and Employment Agencies

AUTOMOTIVE: ENGINE PERFORMANCE

STANDARD 2.0

Students will demonstrate automotive technology safety practices, including Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) requirements for an automotive repair facility.

LEARNING EXPECTATIONS

The student will:

- 2.1** Determine the safe and correct application and disposal for chemicals used in an automotive repair facility.
- 2.2** Use protective clothing, eye protection, and safety equipment.
- 2.3** Use fire protection equipment.
- 2.4** Follow OSHA and EPA regulations affecting engine performance service technology.
- 2.5** Respond to manufacturer safety communications concerning engine performance systems and components.
- 2.6** Passes with 100% accuracy a written examination relating specifically to engine performance safety issues.
- 2.7** Passes with 100% accuracy a performance examination relating specifically to engine performance tools and equipment.
- 2.8** Maintains a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 2.1A** Conforms to federal, state, and local regulations when handling, storing, and disposing of chemicals.
- 2.1B** Ensures proper ventilation for chemical use.
- 2.1C** Locates first aid supplies.
- 2.2A** Demonstrates proper usage of special safety equipment used in performing engine performance servicing.
- 2.2B** Selects and uses the appropriate protective clothing for a given task.
- 2.2C** Demonstrates the use of eye protection.
- 2.3A** Distinguishes the proper fire extinguisher for each class of fire.
- 2.3B** Demonstrates the proper use of a fire extinguisher and other fire protection equipment.
- 2.4A** Locates regulatory information.
- 2.4B** Extracts information from Material Safety Data Sheets.
- 2.4C** Complies with relevant regulations and standards.
- 2.5** Responds to manufacturer safety communications concerning engine performance systems and components.
- 2.6** Passes with 100% accuracy a written examination relating specifically to engine performance safety issues.

- 2.7** Passes with 100% accuracy a performance examination relating specifically to engine performance tools and equipment.
- 2.8** Maintains a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

SAMPLE PERFORMANCE TASKS

- Assess the work area for safety hazards.
- Design a corrections program for identified hazards.
- Model the appropriate protective equipment for an assigned task.

INTEGRATION LINKAGES

Math, Science, Communication Skills, Teamwork Skills, Reading Skills, Leadership Skills, Secretary's Commission on Achieving Necessary Skills (SCANS), National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), SkillsUSA, AYES Curriculum.

AUTOMOTIVE: ENGINE PERFORMANCE

STANDARD 3.0

Students will properly test, diagnose, and service General Engine

LEARNING EXPECTATIONS

The student will:

- 3.1** Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. P-1
- 3.2** Identify and interpret engine performance concern; determine necessary action. P-1
- 3.3** Research applicable vehicle and service information, such as engine management system operation, vehicle service history, service precautions, and technical service bulletins. P-1
- 3.4** Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals). P-1
- 3.5** Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action. P-2
- 3.6** Diagnose abnormal engine noise or vibration concerns; determine necessary action. P-2
- 3.7** Diagnose abnormal exhaust color, odor, and sound; determine necessary action. P-2
- 3.8** Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action. P-1
- 3.9** Perform cylinder power balance test; determine necessary action. P-1
- 3.10** Perform cylinder cranking compression tests; determine necessary action. P-1
- 3.11** Perform engine running compression test; determine necessary action. P-2
- 3.12** Perform cylinder leakage test; determine necessary action. P-1
- 3.13** Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns with an oscilloscope and/or engine diagnostic equipment; determine necessary action. P-1
- 3.14** Prepare 4 or 5 gas analyzer; inspect and prepare vehicle for test, and obtain exhaust readings; interpret readings, and determine necessary action. P-1
- 3.15** Verify engine operating temperature; determine necessary action P-1.
- 3.16** Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action. P-1
- 3.17** Verify correct camshaft timing. P-2

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 3.1** Completes work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. N-AVIII-A-1
- 3.2** Identifies and interprets engine performance concern; determines necessary action. N-AVIII-A2
- 3.3** Researches applicable vehicle and service information, such as engine management system operation, vehicle service history, service precautions, and technical service bulletins. N-AVIII-3

- 3.4 Locates and interprets vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals). N-AVIII-4
- 3.5 Inspects engine assembly for fuel, oil, coolant, and other leaks; determines necessary action. N-AVIII-5
- 3.6 Diagnoses abnormal engine noise or vibration concerns; determines necessary action. N-AVIII-6
- 3.7 Diagnoses abnormal exhaust color, odor, and sound; determines necessary action. N-AVIII-A-7
- 3.8 Performs engine absolute (vacuum/boost) manifold pressure tests; determines necessary action. N-AVIII-A-8
- 3.9 Performs cylinder power balance test; determines necessary action. N-AVIII-A-9
- 3.10 Performs cylinder cranking compression tests; determines necessary action. N-AVIII-A-10
- 3.11 Performs engine running compression test; determines necessary action. N-AVIII-A-11
- 3.12 Performs cylinder leakage test; determines necessary action. N-AVIII-A-12
- 3.13 Diagnoses engine mechanical, electrical, electronic, fuel, and ignition concerns with an oscilloscope and/or engine diagnostic equipment; determines necessary action. N-AVIII-A-13
- 3.14 Prepares 4 or 5 gas analyzer; inspects and prepares vehicle for test, and obtains exhaust readings; interprets readings, and determines necessary action. N-AVIII-A-14
- 3.15 Verifies engine operating temperature; determines necessary action. N-AVIII-A-15
- 3.16 Performs cooling system pressure tests; checks coolant condition; inspects and tests radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action. N-AVIII-A-16
- 3.17 Verifies correct camshaft timing. N-AVIII-A-17

SAMPLE PERFORMANCE TASKS

- Calculate engine compression ratio.
- Diagram the following systems and identify the forces and principles at work in the operation of each:
 - primary fuel system
 - electronic fuel injection system
 - exhaust system
 - ignition system

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES Curriculum, Occupational Safety and Health Administration (OSHA).

AUTOMOTIVE: ENGINE PERFORMANCE

STANDARD 4.0

Students will properly test, diagnose, and service Computerized Engine Controls

LEARNING EXPECTATIONS

The student will:

- 4.1** Retrieve and record stored OBD I diagnostic trouble codes; clear codes. P-3
- 4.2** Retrieve and record stored OBD II diagnostic trouble codes; clear codes. P-1
- 4.3** Diagnose the causes of emissions or driveability concerns resulting from malfunctions in the computerized engine control system with stored diagnostic trouble codes. P-1
- 4.4** Diagnose emissions or driveability concerns resulting from malfunctions in the computerized engine control system with no stored diagnostic trouble codes; determine necessary action. P-1
- 4.5** Check for module communication (including CAN/BUS systems) errors using a scan tool. P-2
- 4.6** Inspect and test computerized engine control system sensors, powertrain control module (PCM), actuators, and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO); perform necessary action. P-1
- 4.7** Obtain and interpret scan tool data. P-1
- 4.8** Access and use service information to perform step-by-step diagnosis. P-1
- 4.9** Diagnose driveability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, A/C, automatic transmissions, non-OEM-installed accessories, or similar systems); determine necessary action. P-3
- 4.10** Perform active tests of actuators using scan tool; determine necessary action. P-1

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 4.1** Retrieves and records stored OBD I diagnostic trouble codes; clears codes. N-AVIII-B-1
- 4.2** Retrieves and records stored OBD II diagnostic trouble codes; clears codes. N-AVIII-B-2
- 4.3** Diagnoses the causes of emissions or driveability concerns resulting from malfunctions in the computerized engine control system with stored diagnostic trouble codes. N-AVIII-B-3
- 4.4** Diagnoses emissions or driveability concerns resulting from malfunctions in the computerized engine control system with no stored diagnostic trouble codes; determines necessary action. N-AVIII-B-4
- 4.5** Checks for module communication (including CAN/BUS systems) errors using a scan tool. N-AVIII-B-5
- 4.6** Inspects and tests computerized engine control system sensors, powertrain control module (PCM), actuators, and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO); performs necessary action. N-AVIII-B-6

- 4.7 Obtains and interprets scan tool data. N-AVIII-B-7
- 4.8 Accesses and uses service information to perform step-by-step diagnosis. N-AVIII-B-8
- 4.9 Diagnoses driveability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, A/C, automatic transmissions, non-OEM-installed accessories, or similar systems); determines necessary action. N-AVIII-B-9
- 4.10 Performs active tests of actuators using scan tool; determines necessary action. N-AVIII-B-10

SAMPLE PERFORMANCE TASKS

- Replace computerized engine control system sensor.
- Retrieve stored OBD (On-Board Diagnostic) I and II diagnostic trouble codes.
- Access electronic service information (ESI) for a given vehicle and use data for diagnosis.
- Read a digital multimeter (DMM).
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Communication Skills, Teamwork Skills, Computer Skills, Reading and Writing Skills, Language Arts, Problem Solving, Interpersonal Skills, Employability Skills, Critical-Thinking Skills, SCANS (Secretary's Commission on Achieving Necessary Skills), National Institute for Automotive Service Excellence, National Automotive Technician Education Foundation, SkillsUSA, AYES Curriculum, Occupational Safety and Health Administration (OSHA).

AUTOMOTIVE: ENGINE PERFORMANCE

STANDARD 5.0

Students will properly test, diagnose, and service Ignition System

LEARNING EXPECTATIONS

The student will:

- 5.1** Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns on vehicles with electronic ignition (distributorless) systems; determine necessary action. P-1
- 5.2** Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns on vehicles with distributor ignition (DI) systems; determine necessary action. P-1
- 5.3** Inspect and test ignition primary circuit wiring and solid state components; perform necessary action. P-2
- 5.4** Inspect, test and service distributor. P-3
- 5.5** Inspect and test ignition system secondary circuit wiring and components; perform necessary action. P-2
- 5.6** Inspect and test ignition coil(s); perform necessary action. P-1
- 5.7** Check and adjust ignition system timing and timing advance/retard (where applicable). P-3
- 5.8** Inspect and test ignition system pick-up sensor or triggering devices; perform necessary action. P-1

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 5.1** Diagnoses ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns on vehicles with electronic ignition (distributorless) systems; determines necessary action. N-AVIII-C-1
- 5.2** Diagnoses ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns on vehicles with distributor ignition (DI) systems; determines necessary action. N-AVIII-C-2
- 5.3** Inspects and tests ignition primary circuit wiring and solid state components; performs necessary action. N-AVIII-C-3
- 5.4** Inspects, tests and services distributor. N-AVIII-C-4
- 5.5** Inspects and tests ignition system secondary circuit wiring and components; performs necessary action. N-AVIII-C-5
- 5.6** Inspects and tests ignition coil(s); performs necessary action. N-AVIII-C-6
- 5.7** Checks and adjusts ignition system timing and timing advance/retard (where applicable).

N-AVIII-C-7

- 5.8** Inspects and tests ignition system pick-up sensor or triggering devices; performs necessary action. N-AVIII-C-8

SAMPLE PERFORMANCE TASKS

- Repair damaged distributor.
- Diagnose and adjust advanced ignition system timing.
- Using case scenarios, follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES Curriculum, Occupational Safety and Health Administration (OSHA).

AUTOMOTIVE: ENGINE PERFORMANCE

STANDARD 6.0

Students will properly test, diagnose, and service Fuel, Air Induction, and Exhaust Systems

LEARNING EXPECTATIONS

The student will:

- 6.1** Diagnose hot or cold no-starting, hard starting, poor driveability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems on vehicles with injection-type fuel systems; determine necessary action. P-1
- 6.2** Check fuel for contaminants and quality; determine necessary action. P-3
- 6.3** Inspect and test fuel pumps and pump control systems for pressure, regulation and volume; perform necessary action. P-1
- 6.4** Replace fuel filters. P-1
- 6.5** Inspect and test cold enrichment system and components; perform necessary action. P-3
- 6.6** Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air. P-2
- 6.7** Inspect and test fuel injectors.
- 6.8** Check idle speed. P-3
- 6.9** Inspect the integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shield(s); perform necessary action. P-2
- 6.10** Perform exhaust system back-pressure test; determine necessary action. P-1
- 6.13** Test the operation of turbocharger/supercharger systems; determine necessary action. P-3

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 6.1** Diagnoses hot or cold no-starting, hard starting, poor driveability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems on vehicles with injection-type fuel systems; determines necessary action. N-AVIII-D-1
- 6.2** Checks fuel for contaminants and quality; determines necessary action. N-AVIII-D-2
- 6.3** Inspects and tests fuel pumps and pump control systems for pressure, regulation and volume; performs necessary action. N-AVIII-D-3
- 6.4** Replaces fuel filters. N-AVIII-D-4
- 6.5** Inspects and tests cold enrichment system and components; performs necessary action. N-AVIII-D-5
- 6.6** Inspects throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air. N-AVIII-D-6
- 6.7** Inspects and tests fuel injectors. N-AVIII-D-7
- 6.8** Checks idle speed. N-AVIII-D-8

- 6.9** Inspects the integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shield(s); performs necessary action. N-AVIII-D-8
- 6.10** Performs exhaust system back-pressure test; determines necessary action. N-AVIII-D-10
- 6.11** Tests the operation of turbocharger/supercharger systems; determines necessary action. N-AVIII-D-11

SAMPLE PERFORMANCE TASKS

- Inspect and change fuel filter.
- Check fuel pressure and quantity against manufacturer's specifications.
- Adjust idle speed.
- Replace fuel injectors.
- Using scenarios, follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacturer allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES Curriculum, Occupational Safety and Health Administration (OSHA).

AUTOMOTIVE: ENGINE PERFORMANCE

STANDARD 7.0

Students will properly test, diagnose, and service Emissions Control Systems Exhaust Gas Recirculation/ Exhaust Gas Treatment/ Evaporative Emissions Controls.

LEARNING EXPECTATIONS

The student will:

- 7.1** Diagnose oil leaks, emissions, and driveability problems resulting from malfunctions in the positive crankcase ventilation (PCV) system; determine necessary action.
- 7.2** Inspect, test and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action.
- 7.3** Diagnose emissions and driveability problems caused by malfunctions in the exhaust gas recirculation (EGR) system; determine necessary action.
- 7.4** Inspect, test, service and replace components of the EGR system, including EGR tubing, exhaust passages, vacuum/pressure controls, filters and hoses; perform necessary action.
- 7.5** Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; perform necessary action.
- 7.6** Diagnose emissions and driveability problems resulting from malfunctions in the secondary air injection and catalytic converter systems; determine necessary action
- 7.7** Inspect and test mechanical components of secondary air injection systems; perform necessary action.
- 7.8** Inspect and test electrical/electronically-operated components and circuits of air injection systems; perform necessary action.
- 7.9** Inspect and test catalytic converter performance.
- 7.10** Diagnose emissions and driveability problems resulting from malfunctions in the evaporative emissions control system; determine necessary action.
- 7.11** Inspect and test components and hoses of evaporative emissions control system; perform necessary action.
- 7.12** Interpret evaporative emission related diagnostic trouble codes (DTCs); determine necessary action.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 7.1** Diagnoses oil leaks, emissions, and driveability problems resulting from malfunctions in the positive crankcase ventilation (PCV) system; determines necessary action. N-AVIII-E-1-1
- 7.2** Inspects, tests and services positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; performs necessary action. N-AVIII-E-1-2
- 7.3** Diagnoses emissions and driveability problems caused by malfunctions in the exhaust gas recirculation (EGR) system; determines necessary action. N-AVIII-E-2-1

- 7.4 Inspects, tests, services and replace components of the EGR system, including EGR tubing, exhaust passages, vacuum/pressure controls, filters and hoses; performs necessary action. N-AVIII-E-2-2
- 7.5 Inspects and tests electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; performs necessary action. N-AVIII-E-2-3
- 7.6 Diagnoses emissions and driveability problems resulting from malfunctions in the secondary air injection and catalytic converter systems; determines necessary action. N-AVIII-E-3-1
- 7.7 Inspects and tests mechanical components of secondary air injection systems; performs necessary action. N-AVIII-E-3-2
- 7.8 Inspects and tests electrical/electronically-operated components and circuits of air injection systems; performs necessary action. N-AVIII-E-3-3
- 7.9 Inspects and tests catalytic converter performance. N-AVIII-E-3-4
- 7.10 Diagnoses emissions and driveability problems resulting from malfunctions in the evaporative emissions control system; determines necessary action. N-AVIII-E-4-1
- 7.11 Inspects and tests components and hoses of evaporative emissions control system; performs necessary action. N-AVIII-E-4-2
- 7.12 Interprets evaporative emission related diagnostic trouble codes (DTCs); determines necessary action. N-AVIII-E-4-3

SAMPLE PERFORMANCE TASKS

- Record information drawn from an exhaust emission inspection.
- Diagnose problem with and make needed repair to catalytic converter system.
- Replace exhaust manifold.
- Replace EGR (exhaust gas re-circulation) system filters or hoses.
- Using scenarios, follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacturer allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES Curriculum, Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA).

AUTOMOTIVE: ENGINE PERFORMANCE

STANDARD 8.0

Students will properly test, diagnose, and service Engine Related.

LEARNING EXPECTATIONS

The student will:

- 8.1** Adjust valves on engines with mechanical or hydraulic lifters. P-1
- 8.2** Remove and replace timing belt; verify correct camshaft timing. P-1
- 8.3** Remove and replace thermostat and gasket. P-1
- 8.4** Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action. P-1
- 8.5** Perform common fastener and thread repairs to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert. P-1
- 8.6** Perform oil and filter change. P-1
- 8.7** Demonstrate proficiency in using oxy-acetylene torch to heat and cut metal. P-3
- 8.8** Identify hybrid vehicle internal combustion engine service precautions. P-3

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student will:

- 8.1** Adjusts valves on engines with mechanical or hydraulic lifters. N-AVIII-F-1
- 8.2** Removes and replaces timing belt; verify correct camshaft timing. N-AVIII-F-2
- 8.3** Removes and replaces thermostat and gasket. N-AVIII-F-3
- 8.4** Inspects and tests mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; performs necessary action. N-AVIII-F-4
- 8.5** Performs common fastener and thread repairs to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert. N-AVIII-F-5
- 8.6** Performs oil and filter change. N-AVIII-F-6
- 8.7** Demonstrates proficiency in using oxy-acetylene torch to heat and cut metal. N-AVIII-F-7
- 8.8** Identifies hybrid vehicle internal combustion engine service precautions. N-AVIII-F-8

SAMPLE PERFORMANCE TASKS

- Diagnose a customer complaint about engine noise.
- Repair coolant leak.
- Use an oscilloscope to diagnose a performance problem.
- Using scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacturer allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES Curriculum, Occupational Safety and Health Administration (OSHA).

AUTOMOTIVE: ENGINE PERFORMANCE

STANDARD 9.0

Students will demonstrate communication skills required in the automotive service industry.

LEARNING EXPECTATIONS

The student will:

- 9.1** Communicate and comprehend oral and written information typically occurring in engine performance service.
- 9.2** Solve engine performance problems and make decisions using a logical process.
- 9.3** Use teamwork skills to accomplish goals, solve problems, and manage conflict within groups.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 9.1A** Interprets and uses written information in common job formats, such as tables, charts, and reference materials, manuals, and manufacturer referring to engine performance.
- 9.1B** Interprets and uses graphical information such as blueprints, electrical schematics, process control schematics, automotive flow diagrams, and other automotive diagrams referring to engine performance.
- 9.1C** Uses electronic resources to obtain service and other information concerning engine performance.
- 9.1D** Analyzes information obtained from various sources to determine a diagnostic approach.
- 9.1E** Communicates clearly and appropriately in oral and written form.
- 9.1F** Interprets an automotive repair order.
- 9.2A** Develops a hypothesis regarding the cause of an engine performance problem.
- 9.2B** Tests the hypothesis to determine the solution to the engine performance problem.
- 9.2C** Creates, evaluates, and revises as needed a plan to resolve an engine performance problem.
- 9.2D** Implements strategy based diagnostic procedure by verifying the complaint, defining the problem, isolating the problem, validating the problem, making repairs, and testing the repairs in an automotive engine.
- 9.3A** Serves in each of the functional roles of a team.
- 9.3B** Resolves conflicts within a group.
- 9.3C** Demonstrates appropriate and positive examples of giving and accepting criticism.
- 9.3D** Modifies behavior or revises work based on appropriate criticism.
- 9.3E** Solves problems in cooperation with other members of a group.
- 9.3F** Evaluates the role of the engine performance technician within the organizational system of a dealership or fleet shop.

SAMPLE PERFORMANCE TASKS

- Complete an automotive repair order and calculate salary based on manufacture labor operation time.
- Use reference materials to determine procedures for diagnosing and testing engines.
- Work as a team member to develop a diagnostic strategy.
- Use blueprints and diagrams to execute a task.

INTEGRATION LINKAGES

Communication Skills, Teamwork Skills, Computer Skills, Reading and Writing Skills, Language Arts, Problem Solving, Interpersonal Skills, Employability Skills, Critical-Thinking Skills, SCANS (Secretary's Commission on Achieving Necessary Skills), National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES Curriculum.

AUTOMOTIVE: ENGINE PERFORMANCE

STANDARD 10.0

Students will demonstrate interpersonal and employability skills required in the automotive services industry.

LEARNING EXPECTATIONS

The student will:

- 10.1** Evaluate career goals and establish long-term goals.
- 10.2** Demonstrate attitudes conducive to workplace success.
- 10.3** Maintain a neat and orderly work area.
- 10.4** Assess implications of diversity for communities, workplaces, and manufacturers.
- 10.5** Develop personal financial skills.
- 10.6** Develop individual time management and work sequencing skills relating to engine performance procedures.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 10.1A** Explores opportunities for advanced training.
- 10.1B** Assesses the potential impact of an individual's educational level on an organizational system.
- 10.1C** Infers the relationship between work ethics, education, and personal job success.
- 10.2A** Judges which attitudes and behaviors are conducive to success.
- 10.2B** Models customer service skills.
- 10.3A** Keeps work area organized and free from clutter according to NATEF and OSHA standards.
- 10.3B** Deduces the correlation between a clean orderly work environment and successful and efficient job performance and earnings.
- 10.4A** Points out potential benefits and problems that may arise from diversity in the automotive service workplace, including manufacturer diversity.
- 10.4B** Devises solutions to problems arising from gender, cultural, racial, and religious diversity.
- 10.5A** Develops a personal budget.
- 10.5B** Sets personal financial goals.
- 10.6** Displays time management and work sequencing skills in class assignments and work assignments.

SAMPLE PERFORMANCE TASKS

- Maintain an orderly work area.
- Consistently arrive at class on time.
- Participate in an internship in a dealership or fleet shop.
- Resolve an interpersonal conflict in the classroom.

INTEGRATION LINKAGES

Math, Science, Communication Skills, Teamwork Skills, Reading Skills, Leadership Skills, Secretary's Commission on Achieving Necessary Skills, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), SkillsUSA, AYES Curriculum.

AUTOMOTIVE: ENGINE PERFORMANCE

SAMPLING OF AVAILABLE RESOURCES

A8 Automotive Engine Performance Course, AYES Curriculum, AYES Corporation,
www.ayes.org

A8 Engine Performance, CD-ROM, Interactive Computer Based Training, DVP/CDX,
1-888-873-2239

Curriculum Integrator, CORD Communications, Waco, Texas 1998

Engine Performance Specialist, Service Series Curriculum and Instructional Materials Center
(CIMC), Oklahoma Department of Vocational and Technical Education

Module 3 Engine Performance, Instructional Materials Laboratory (IML), University of Missouri

Today's Technician Automotive Engine Performance, Knowles, Delmar Publishing, 1999

2002 Automobile Task List, National Automotive Technicians Education Foundation (NATEF),
www.natef.org